IMPORTANT: BEFORE STARTING THE EQUIPMENT, READ THE CONTENTS OF THIS MANUAL, WHICH MUST BE STORED IN A PLACE FAMILIAR TO ALL USERS FOR THE ENTIRE OPERATIVE LIFE-SPAN OF THE MACHINE. THIS EQUIPMENT MUST BE USED SOLELY FOR WELDING OPERATIONS.

1 SAFETY PRECAUTIONS

WELDING AND ARC CUTTING CAN BE HARMFUL TO YOURSELF AND OTHERS. The user must therefore be educated against the hazards, summarized below, deriving from welding operations. For more detailed information, order the manual code 3.300.758

ELECTRIC SHOCK - May be fatal.
• Install and earth the welding machine according to the applicable regulations.
• Do not touch live electrical parts or electrodes with bare skin, gloves or wet clothing.
• Isolate yourselves from both the earth and the workpiece.
• Make sure your working position is safe.

FUMES AND GASES - May be hazardous to your health.
• Keep your head away from fumes.
• Work in the presence of adequate ventilation, and use ventilators around the arc to prevent gases from forming in the work area.

ARC RAYS - May injure the eyes and burn the skin.
• Protect your eyes with welding masks fitted with filtered lenses, and protect your body with appropriate safety garments.
• Protect others by installing adequate shields or curtains.

RISK OF FIRE AND BURNS
• Sparks (sprays) may cause fires and burn the skin; you should therefore make sure there are no flammable materials in the area, and wear appropriate protective garments.

NOISE
This machine does not directly produce noise exceeding 80dB. The plasma cutting/welding procedure may produce noise levels beyond said limit; users must therefore implement all precautions required by law.

PACEMAKERS
• The magnetic fields created by high currents may affect the operation of pacemakers. Wearers of vital electronic equipment (pacemakers) should consult their physician before beginning any arc welding, cutting, gouging or spot welding operations.

EXPLOSIONS
• Do not weld in the vicinity of containers under pressure, or in the presence of explosive dust, gases or fumes. • All cylinders and pressure regulators used in welding operations should be handled with care.

EMETRICALLYMAGNETIC COMPATIBILITY
This machine is manufactured in compliance with the instructions contained in the harmonized standard EN50199, and must be used solely for professional purposes in an industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in non-industrial environments.

IN CASE OF MALFUNCTIONS, REQUEST ASSISTANCE FROM QUALIFIED PERSONNEL.

2 GENERAL DESCRIPTIONS

2.1 SPECIFICATIONS
This equipment is a power source developed using INVERTER technology, suitable for MIG/MAG and OPEN-ARC welding.

2.2 EXPLANATION OF TECHNICAL SPECIFICATIONS

EN 50199
EN60974.1
N°.
The welding machine is manufactured according to these standards.
Serial number, which must be indicated on any type of request regarding the welding machine.
Single-phase static transformer-rectifier frequency converter.

Suitable for continuous electrode (MIG/MAG) welding.

Unconventional welding current. The values represent the minimum and maximum levels attainable in welding.

Secondary open-circuit voltage (peak V)

Duty cycle percentage.
The duty cycle expresses the percentage of 10 minutes during which the welding machine may run at a certain current without overheating.

Welding current
Secondary voltage with welding current I2
Rated supply voltage.
Absorbed current at the corresponding welding current I2.
Protection rating for the housing.
Grade 3 as the second digit means that this equipment is suitable for use outdoors in the rain.
Suitable for use in high-risk environments.

NOTES: The welding machine has also been designed for use in environments with a pollution rating of 3. (See IEC 664).

2.3 PROTECTIONS

2.3.1 Block protection
In the event of a malfunction, a number with the following meaning may appear on the display G:
52 = Start button pressed during start-up.
53 = start button pressed during thermostat reset.
56 = Extended short-circuit between the welding electrode and the material to be welded.
Shut the machine off and turn it back on.
If different numbers appear on the display, contact technical service.
2.3.2 Mechanical protection (safety button)
When the movable side is opened, this activates the safety button which prevents operation of the welding machine. This protection, indicated when the LED A is lit, avoids hazardous situations when the operator replaces the roller of the wire feeder unit or the welding electrode.

2.3.3 Thermal protection
This machine is protected by a thermostat, which prevents the machine from operating if the allowable temperatures are exceeded. Under these conditions the fan keeps running and the LED A lights.

3 INSTALLATION

Make sure that the supply voltage matches the voltage indicated on the specifications plate of the welding machine. Mounting a plug with an adequate capacity for the supply cable, making sure that the yellow/green conductor is connected to the earth pin. The capacity of the overload cutout switch or fuses installed in series with the power supply must be equivalent to the absorbed current I1 of the machine.

3.1 Setup
The machine must be installed by skilled personnel. All connections must be carried out according to current regulations, and in full observance of safety laws (regulation CEI 26-10 - CENELEC HD 427).

3.2 CONTROLS ON THE FRONT PANEL.

A- LED yellow.
Lights when the thermostat or safety button interrupt operation of the welding machine.

B- Setting knob.
- Adjusts the welding wire speed when using manual programs.
  In this condition the display G indicates only the current during welding.
- When using synergic programs, it allows you to preset the current and adjust during welding. The current is indicated, in all conditions, by the display G.
  During welding, this current may vary (although only slightly) based on the thickness of the material and the manual skill of the operator. It is essential to use the R key to select the correct welding program so that the display G indicates the correct preset current value.
C - LED green.
Signals activation of the spot or dash welding mode when lit together with LED M.

D - Setting knob.
This knob adjusts the spot welding or working time during dash welding. The duration ranges from 0.3 to 5 seconds.
E - Central adapter
This is where the welding torch is to be connected.

F - Earth socket
Grounding cable socket.

G - 3-digit display.
This display shows the welding current, which remains saved after welding; in addition, it briefly displays the type of material selected when a program is selected. With the PULL 2000 torch, used with program #2 (manual for AL), the display shows a value (between 1 and 10) in proportion to the wire speed.

H - LED green.
Indicates that the welding machine is on.

I - Setting knob.
• Adjusts the welding voltage in manual programs.
• In synergic programs, the indicator of this knob must be set to the “SYNERGIC” symbol in the center of the setting range. Adjusting this knob allows you to correct the voltage value (arc length). The operator may need to change the saved values for various reasons: a non-standard torch may change the wire movement slightly, the size and thickness of the workpiece may require minor corrections from the set values, the operator may need to change the saved voltage out of habit or due to his or her own needs. Obviously, any increases or decreases to the saved voltage value will be repeated throughout the synergic curve.

L - LED green.
Indicates that continuous welding mode is activated.

M - LED green.
Indicates that 2-stage manual dash welding mode is activated. It lights together with LED C.

N - Setting knob.
This knob adjusts the pause time between spot welds. The duration ranges from 0.3 to 5 seconds.

O - Key.
Press this key to light in sequence the LEDs C, L along with the LEDs M and C.

P - Setting knob.
This knob adjust the impedance value. For each program, the optimum value is the 0 position. The machine automatically sets the correct impedance value based on the program selected. The operator may correct the set value: adjusting the potentiometer towards + will produce warmer, less penetrating welds, while vice-versa adjusting towards - will produce colder and more penetrating welds. When welding with a synergic program, adjusting + or - from the central 0 may require corrections to the working voltage using the potentiometer I.

Q - 2-digit display.
This display shows the program number selected by the R key.

R - Key.
This key selects the program number, which appears on the display Q.
The instructions for deciding which program to use are provided in a packet inside the mobile side panel.

S - 10-pin connector.
This connector must be connected to the 10-pin male of the Pull 2000 or spool-gun torch.

3.3 CONTROLS ON THE REAR PANEL

T - Gas hose fitting.
U-Switch.
Turns the machine on and off.

4 WELDING

4.1 Installation
Make sure that the wire diameter corresponds to the diameter indicated on the wire feeder roller, and that the selected program is compatible with the material and type of gas. Use wire feeder rollers with a "U"-shaped groove for aluminum
wires, and with a "V"-shaped groove for other wires. Based on the type of wire to be used, make sure that the cables corresponding to the torch and earth clamp are properly connected to the terminal board accessible from the door on the right-hand side of the machine. Normally, with wires that require gas protection, the torch must be connected to the (+) pole.

4.1.1 Connecting the gas hose
The gas cylinder must be equipped with a pressure regulator and flow gauge. If the gas cylinder is placed on the cylinder shelf of the trolley (Art. 1441) it must be fastened using the chain provided. Connect the gas hose leaving the rear of the machine to the pressure regular, only after positioning the cylinder. The gas flow must be adjusted to approximately 8-10 liters per minute.

4.2 THE MACHINE IS READY TO WELD
When using the Pull-2000 or Spool-Gun torch, follow the instructions enclosed.
- Connect the earth clamp to the workpiece.
- Set the switch U to I.
- Remove the gas nozzle.
- Unscrew the contact tip.
- Insert the wire in the wire liner of the torch, making sure that it is inside the roller groove and that the roller is in the correct position.
- Press the torch trigger to move the wire forward until it comes out of the torch.
- Caution: keep your face away from the gun tube assembly while the wire is coming out.
- Screw the contact tip back on, making sure that the hole diameter is the same as that of the wire used.
- Assemble the gas nozzle.

4.3 WELDING CARBON STEEL
In order to weld these materials you must:

4.3.1 With gas protection
- Use a welding gas with a binary composition, usually ARGON + CO2 with percentages of Argon ranging from 75% up. With this blend, the welding bead will be well jointed and attractive. Using pure CO2 as a protection gas will produce narrow beads, with greater penetration but a considerably increase in splatters.
- Use a welding wire of the same quality as the steel to be welded. It is best to always use good quality wires, avoiding welding with rusted wires that could cause welding defects.
- Avoid welding rusted parts, or those with oil or grease stains.

4.3.2 Without gas protection
To achieve well connected and protected welds, always work from left to right and top to bottom. The flux-cored wires Ø 0.9 Art. 1586 or Art.1587 must be used with the torch connected to the (-) pole.

4.4 WELDING STAINLESS STEEL
Series 300 stainless steels must be welded using a protection gas with a high Argon content, containing a small percentage of O2 or carbon dioxide CO2 (approximately 2%) to stabilize the arc. Do not touch the wire with your hands. It is important to keep the welding area clean at all times, to avoid contaminating the joint to be welded.

4.5 WELDING ALUMINUM
In order to weld aluminum you must use:
- Pure Argon as the protection gas.
- A welding wire with a composition suitable for the base material to be welded.
- Use mills and brushing machines specifically designed for aluminum, and never use them for other materials.
- In order to weld aluminum you must use the torches: PULL 2000 Art. 1561 or SPOOL-GUN Art. 1562 with the connection Art. 1196.

5 WELDING DEFECTS

1 DEFECT - Porosity (within or outside the bead)
CAUSES
- Electrode defective (rusted surface)
- Missing shielding gas due to:
  - low gas flow
  - flow gauge defective
  - regulator frosted due to no preheating of the CO2 protection gas
  - defective solenoid valve
  - contact tip clogged with spatter
  - gas outlet holes clogged
  - air drafts in welding area.

2 DEFECT - Shrinkage cracks
CAUSES
- Wire or workpiece dirty or rusted.
- Bead too small.
- Bead too concave.
- Bead too deeply penetrated.

3 DEFECT - Side cuts
CAUSES
- Welding pass done too quickly
- Low current and high arc voltages.

4 DEFECT - Excessive spraying
CAUSES
- Voltage too high.
• Insufficient inductance.
• No preheating of the CO2 protection gas

6 MAINTAINING THE SYSTEM

• Shielding gas nozzle
  This nozzle must be periodically cleaned to remove weld spatter. Replace if distorted or squashed.
• Contact tip.
  Only a good contact between this contact tip and the wire can ensure a stable arc and optimum current output; you must therefore observe the following precautions:
  A) The contact tip hole must be kept free of grime and oxidation (rust).
  B) Weld spatter sticks more easily after long welding sessions, blocking the wire flow.
The tip must therefore be cleaned more often, and replaced if necessary.
  C) The contact tip must always be firmly screwed onto the torch body. The thermal cycles to which the torch is subjected can cause it to loosen, thus heating the torch body and tip and causing the wire to advance unevenly.
• Wire liner.
  This is an important part that must be checked often, because the wire may deposit copper dust or tiny shavings. Clean it periodically along with the gas lines, using dry compressed air.
The liners are subjected to constant wear and tear, and therefore must be replaced after a certain amount of time.
• Gearmotor group.
  Periodically clean the set of feeder rollers, to remove any rust or metal residue left by the coils. You must periodically check the entire wire feeder group: hasp, wire guide rollers, liner and contact tip.

7 ACCESSORIES

Art. 1441 Wire feeder.
Art. 1561 Pull 2000 torch with UP/DOWN command on grip.
Art. 1562 Spool-gun torch with potentiometer on grip.
Art. 1196.00 6-meter connection for 1562.
Art. 1196.20 12-meter connection for 1562.